

STEREO MOC Status Report  
Time Period: 2015:082 - 2015:088

STEREO Ahead (STA) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

- On day 082, during the DSS-63 support, turbo decoder lock was lost intermittently throughout the track due to the effects of solar scintillation. This anomaly resulted in the loss of four no-op commands not being received and 346 frames (14%) of spacecraft SSR playback and real-time data.
- On day 083, during the DSS-63 support, turbo decoder lock was lost intermittently throughout the track due to the effects of solar scintillation. Ranging was disabled at 1504z due to insufficient ranging margin. Three 3 no-op commands were not received. At 1543z, the command to reset the Ahead observatory into its solar conjunction configuration was sent. This was the last command to be sent until exiting solar conjunction. While the RF communications were poor during the DSS-63 support with over 50% of the expected telemetry frames not received, most likely due to a CME that occurred 6 hours earlier, post reset, 93 good telemetry frames or 38% of the expected frames were received intermittently for 46 minutes with the observatory rotating at 5 degrees per minute on the second HGA side lobe.
- On day 083, during the DSS-14 support, with the observatory rotating at 5 degrees per minute on the second HGA side lobe, telemetry was received intermittently except for a 5 to 6 minute gap during each 72 minute rotation. 181 good telemetry frames or 25% of the expected frames were received.
- On day 084, during the DSS-14 support, with the observatory rotating at 5 degrees per minute on the -Z LGA, telemetry lock was never received due to the low signal strength as the LGA is on the edge of the hemispherical pattern. Carrier lock was maintained with the carrier power between -168 and -173 dBm.

- On day 085, during the DSS-63 support, with the observatory rotating at 5 degrees per minute on the -Z LGA, telemetry lock was never received due to the low signal strength as the LGA is on the edge of the hemispherical pattern. Carrier lock was maintained, except for a 7 minute loss starting at 1441z, with the carrier power between -169 and -173 dBm.
- On day 086, during the DSS-63 support, with the observatory rotating at 5 degrees per minute on the +Z LGA, telemetry lock was never received due to the low signal strength as the LGA is on the edge of the hemispherical pattern. Carrier lock was intermittent with the carrier power between -169 and -173 dBm. Carrier lock was lost at 1636z for 6 minutes due to the first hard command loss timer (HCLT) initiated system reset. At 1642z, telemetry lock was received from the HGA second side lobe. Telemetry lock was intermittent at 1656z for the remainder of the support. Post reset, 180 telemetry frames or 70% of the expected frames were received.
- On day 086, during the DSS-14 support, with the observatory rotating at 5 degrees per minute on the second HGA side lobe, telemetry was received intermittently. 887 good telemetry frames or 64% of the expected frames were received.
- On day 087, during the DSS-14 support, with the observatory rotating at 5 degrees per minute on the second HGA side lobe, telemetry was received intermittently. 114 good frames or 22% of the expected frames were received. Two hours into the support, the spacecraft switched to the -Z LGA as planned. Carrier lock was maintained for the remaining 8.3 hours of the support, except for a 12 minute loss starting at 1822z, with the carrier power between -168 and -174 dBm.
- On day 088, during the DSS-63 support, with the observatory rotating at 5 degrees per minute on the -Z LGA, while carrier lock was intermittent for 7.7 hours, 2 telemetry frames were received. After the spacecraft switched to the +Z LGA as planned, carrier lock was intermittently lost for the remaining 45 minutes of the support with the carrier power between -172 and -174 dBm.

- On day 088, during the DSS-14 support, with the observatory rotating at 5 degrees per minute on the +Z LGA, telemetry lock was never received due to the low signal strength as the LGA is on the edge of the hemispherical pattern. Carrier lock was intermittent for duration of the support with the carrier power between -169 and -174 dBm.
2. The following spacecraft/instrument events occurred during this week. Note that the Ahead observatory is operating on the second side lobe of the HGA to prevent overheating of the HGA feed assembly which is currently at 113 degrees C with the HGA angle at 8.1 degrees, with respect to the spacecraft-Sun line.
- On day 080, at approximately 1300z, the Ahead and Behind observatories were in conjunction, i.e., their separation angle was zero.
  - On day 083, at 1600z the Ahead observatory initiated a commanded system reset to enter its configuration for solar conjunction. The DSN received a strong downlink signal at 1621z and telemetry was received at 1622z. The star tracker was "lazy" for 38 seconds longer than expected to re-acquire a solution causing IMU2 to power on for two hours. The SWAVES instrument remains on as planned. The IMPACT and PLASTIC space weather SSR partitions are at 53 and 51 percent full respectively, and SWAVES, which is continuing to record at one packet per minute, is at 34 percent full. The HGA feed temperature was at 114 degrees C.
  - On day 086, at 1620z, the Ahead observatory initiated the first planned HCLT system reset during solar conjunction. The DSN received a strong downlink signal at 1641z and telemetry was received at 1642z. The star tracker was again "lazy" in re-acquiring a solution causing IMU2 to power on for two hours. The SWAVES instrument remains on as planned. The IMPACT and PLASTIC space weather SSR partitions remain at 53 and 51 percent full respectively, and SWAVES, which is continuing to record at one packet per minute, is at 34.3 percent full. The HGA feed temperature was at 113 degrees C.

STEREO Behind (STB) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

- None.

2. Detailed status of the activities that occurred on the Behind loss of communication anomaly, which occurred on day 2014-274, are listed below.

- The Behind observatory entered superior solar conjunction at the two degree SPE angle on day 022. Recovery efforts will resume post solar conjunction on day 124, May 4<sup>th</sup>; with implementing the Failure Review Board recommendations and increasing the ground transmit power through arraying uplink stations.

Significant findings to date:

1. Analysis of the three DSN extracted telemetry frames from the carrier signal just before the planned observatory reset/anomaly occurred on day 2014-274, October 1<sup>st</sup>, showed nominal performance of the spacecraft, i.e., no anomalies, IMU off, and the star tracker providing an attitude solution.
2. Post reset, from the very limited telemetry, three packets, extracted from the carrier signal by the DSN, the X-axis gyro on IMU-A had failed. Unfortunately, this telemetry contained only G&C anomaly data and no spacecraft summary data, i.e., the state of the RF, G&C, fault protection and other subsystems is not known at the time of the anomaly. With a failed IMU and the star tracker being off-line for an undetermined duration, the sun sensors will keep the observatory pointed at the Sun, though the G&C will not have any roll knowledge, and cannot roll the observatory as part of the safing configuration to re-establish communications on the LGAs. From analysis of this telemetry and initial G&C simulations, it is highly suspected that the observatory is rotating about the principal axis of inertia due to an autonomous momentum dump initiated by biased gyro data flagged good by the IMU, but this has not yet been confirmed.
3. At least two anomalies occurred post reset, the star tracker not promoting to AAD mode and the X-axis gyro

failure. Unfortunately, due to the number of possible combinations, the STEREO fault protection system is not designed for simultaneous failures.

The cause and effect analysis of the loss of communications from the LGAs is continuing. G&C simulations using the biased gyro data flagged good by the IMU are continuing to better understand the potential impact to the observatory state. Recovery from a negative power state is also being investigated. While the recovery and analysis efforts continue on Behind, as the Ahead observatory will enter superior solar conjunction in March, the primary focus of the engineering team is on developing operational configuration changes to add robustness to the G&C rate sensor usage to ensure the Ahead observatory's continued safety.

Once communications are restored and the anomaly resolved, the Behind observatory will be returned to nominal science data collection as soon as it is safely possible.